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TRANSMITTAL OF APPEAL BRIEF (Large Entity)

Docket No.
SAR 13151

In Re Application Of: CHOI

Serial No.	Filing Date	Examiner	Group Art Unit
09/377,383	AUGUST 19, 1999	D. DANG	2621

Invention:

APPARATUS AND METHOD FOR FORMING A CODING UNIT

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TO THE ASSISTANT COMMISSIONER FOR PATENTS:

Transmitted herewith in triplicate is the Appeal Brief in this application, with respect to the Notice of Appeal filed on **March 19, 2001 and received in** the U.S. Patent and Trademark Office on March 21, 2001.

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Signature

Dated: **May 21, 2001**

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I certify that this document and fee is being deposited on **May 21, 2001** with the U.S. Postal Service as first class mail under 37 C.F.R. 1.8 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

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SN 09/377,383

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IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE

PATENT APPLICATION

In re Application of: Bing-Bing Chai	:	Docket #: SAR 13151
Serial No.: 09/377,383	:	Filed: August 19, 1999
Group Art Unit: 2621	:	Examiner: Duy M Dang

Title: APPARATUS AND METHOD FOR FORMING A CODING UNIT

BRIEF ON APPEAL

Honorable Commissioner of
Patents and Trademarks
Washington, D.C. 20231

Sir:

The following appeal brief is submitted pursuant to the Notice of Appeal filed on March 19, 2001 and received by the Patent Office on March 21, 2001 in the above-identified application.

REAL PARTIES IN INTEREST

The real parties in interest are the Sarnoff Corporation and Sharp.

RELATED APPEALS AND INTERFERENCES

No other appeals or interferences that directly affect, or are directly affected by, or have a bearing on the Board's decision in the pending appeal are known to the Appellant, Appellant's legal counsel, or the Assignees.

STATUS OF CLAIMS

Claims 1-13 stand under final rejection, from which rejection this appeal is taken.

STATUS OF AMENDMENTS

An Amendment in accordance with 37 C.F.R. 1.111 was filed on

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October 5, 2000 in response a non-final Office Action dated July 5, 2000. Claim 3 was amended. Claims 1-2, and 4-13 were not amended.

The Examiner responded to Appellant's October 5, 2000 amendment with a Final Office Action dated December 19, 2000. In the Final Office Action, the Examiner considered Appellant's arguments for claims 1-13, but the Examiner did not find the Appellant's arguments to be persuasive. The Examiner reiterated his rejection of claims 1-13.

An Amendment in accordance with 37 C.F.R. 1.116 was filed on February 20, 2001 in response to the Final Office Action. Claims 1-13 were not amended. In response, the Examiner issued an Advisory Action dated March 7, 2001 and reiterated his rejection of claims 1-13.

Appellant hereby directly appeals the rejection of claims 1-13 from the Final Office Action dated December 19, 2000.

SUMMARY OF INVENTION

The present invention is a novel apparatus and a method for forming a data structure that improves error resilience when applied to the coding of hierarchical subband decomposed coefficients, e.g., wavelet transform coefficients. In the present invention, the data structure is referred to as a "texture unit".

To better understand the present invention, a brief background of the invention is now provided. Specifically, in the field of digital multimedia communications, data streams carrying video, audio, timing and control data are packaged into various "packets". However, transmission of packets over a noisy communication channel, e.g., wireless communication, may cause corruption in the packets received by a receiver/decoder. Furthermore, some data streams or bitstreams carry compressed data that are correlated in a manner such that partial loss of a packet may cause the receiver/decoder to discard the entire packet. Namely, compression methods are useful for representing information as accurately as possible with a minimum number of bits and thus

minimizing the amount of data that must be stored or transmitted. To further increase compression efficiency, some compression methods employ “significance-based” information, e.g., a significance map-value model, to indicate to a receiver/decoder the significance of the transmitted information or absence of transmitted information. The “significance-based” information is often previously defined, e.g., using symbols, such that the receiver/decoder is able to decipher additional information from the transmitted information. However, the loss of compressed data such as “significance-based” information often results in substantial errors when a receiver/decoder attempts to decompress or decode the corrupted data.

Additionally, another compression techniques involves the transformation of an input image into transform coefficients using hierarchical subband decomposition. More specifically, in a hierarchical subband system, with the exception of the highest frequency subbands, every coefficient at a given scale can be related to a set of coefficients at the next finer scale of similar orientation according to a structure called a wavelet tree. The coefficients at the coarsest scale will be called the parent nodes, and all coefficients corresponding to the same spatial or temporal location at the next finer scale of similar orientation will be called child nodes.

A typical method of coding these transform coefficients is in “tree depth scan order as shown in FIG. 1 of Appellant’s specification, where an image is decomposed into three levels of resolution. Specifically, the wavelet coefficients are coded in tree blocks fashion, where each tree block is represented by three separate “texture units” shown with different shadings. Each texture unit is representative of a tree structure starting from the lowest or coarsest AC band to the highest or finest AC band coefficients. However, as the image size is increased, each texture unit will encompass a greater number of transform coefficients such that each texture unit is coded using more than one packet. This is a significant disadvantage because it can cause more information loss if error occurs in

one of these packets. Thus, the loss of a portion of a texture unit, will often cause a significant error or loss of data.

To address this criticality, Appellant discloses an apparatus and method for formulating a data structure or coding unit, e.g., a new texture unit, to packetize such transform coefficients to improve error resilience, regardless of the packet protocol that is employed. In a first embodiment, the texture unit is defined as comprising only those AC transform coefficients that are located in one or more rows in a single subband. For example, a single slice of transform coefficients in a HL_1 subband is collected as a texture unit and then packetized.

In a second embodiment, the texture unit is defined as comprising only those AC transform coefficients that are located in all the subbands of a decomposition level. For example, a single slice of transform coefficients from each of the HL_3, HH_3, LH_3 subbands are collected as a texture unit and then packetized.

In a third embodiment, the texture unit is defined as comprising only those AC transform coefficients that are across "n" subbands, where "n" is a smaller number than the total number of "N" levels of decomposition. Namely, the "depth" of a texture unit in terms of subband is limited to a fixed value of "n". This allows a larger image to be decomposed to a greater number of levels of resolution while minimizing the possibility of having a single texture unit being encoded onto more than one packet. For example, transform coefficients from the HL_2 and HL_1 subbands can be collected as a texture unit and then packetized.

In a fourth embodiment, if the DC component for each of the color components (luminance (Y), C_r (U) and C_b (V)) is coded in bitplanes, then the texture unit is defined as comprising a bitplane from any color components. Thus, each bitplane of the DC transform coefficients is encoded as a single texture unit.

In a fifth embodiment, the packet size varies in accordance with a subband or decomposition level of the hierarchical subband decomposed

image. Namely, in the context of hierarchical subband coding, a smaller packet size is employed for the lower frequency subbands and a larger packet size is employed for the higher frequency subbands.

In sum, the above described coding methods and data structures provide error resilience. Namely, if an error occurs in a packet or a portion thereof, the overall amount of information that is lost will be minimized. In fact, it is likely that the receiver/decoder may account for the loss by applying various error recovery methods.

As suggested in MPEP 1206, Appellant now reads one of the broadest appealed claims on the specification and at the drawings. However, it should be understood that the appealed claim may read on other portions of the specification or other figures that are not listed below.

More specifically, in one embodiment of the present invention, a data structure stored on a computer readable medium comprises a packet header and a payload. More importantly, the payload carries at least one texture unit that consists only of AC coefficients from a single subband of a hierarchical subband decomposed image. (See Appellant's specification, Page 8, line 22 – Page 9, line 9 and Figure 3).

For the convenience of the Board of Patent Appeals and Interferences, Appellant's claim 1 (one of the broadest independent claims) is presented below in claim format with elements read on FIG. 3 of the drawings, as suggested in MPEP 1206. Claim 1 positively recites (with reference numerals added):

> 1. A data structure (300) stored on a computer readable medium comprising:
>
> a packet header (310); and
>
> a payload having at least one texture unit (320a, 320b and/or 320c) consisting only of AC coefficients from a single subband of a hierarchical subband decomposed image.

ISSUES

A. Whether claims 1-13 are patentable under 35 U.S.C. §102(b) over Shapiro, (U.S. patent no. 5,563,960, issued October 8, 1996).

GROUPING OF CLAIMS

The rejected claims have been grouped together in the rejection. Appellants urge that each of the rejected claims stands on its own recitation, the claims being considered to be separately patentable for reasons set forth in more detail infra.

THE REFERENCE

The following reference is relied on by the Examiner:

Author	Publication Title or Reference number	Publication Date
Shapiro	United States Patent 5,563,960	October 8, 1996

BRIEF DESCRIPTION OF THE REFERENCE

Shapiro teaches a method and apparatus for emphasizing a selected portion of an image during a coding process. Specifically, Shapiro allocates more bits to a selected region of an image at the expense of other regions of the image. Specifically, Shapiro selects a region R_I of the image to be emphasized and then multiplies a corresponding scaling factor S_I to the selected region. (See Shapiro, Abstract, and Column 3, lines 25-49). Once bit allocation is performed on the image, Shapiro codes the image using conventional subband decomposition and creates a bitstream comprising header bits and data bits representative of the image (See Shapiro, Figure 1, and column 3, lines 46-50). There is absolutely no disclosure of any special treatment in the packetization of the encoded image data. In other words, Shapiro is disclosing a method in the image processing of the image into a bitstream (e.g., image compression and resource allocation in encoding

bits), but once the image is in a form ready to be packaged into a packet, Shapiro is completely silent about the packetization methodology. In conclusion, Shapiro discloses a novel image processing method, but is devoid of any disclosure in the packetization of the encoded image.

ARGUMENT

THE ISSUES UNDER 35 U.S.C. § 102

It is submitted that a reasonable interpretation of the reference as proposed by the Examiner in the first Office Action and the Final Office Action would not have anticipated the invention as recited in the Appellant's claims.

A. 35 U.S.C. § 102 - Claims 1 and 7.

The Examiner rejected claims 1 and 7 in Paragraph 3 of the Office Action as being unpatentable over Shapiro (U.S. patent 5,563,960, issued October 8, 1996). The rejection is respectfully traversed.

Specifically, the Examiner alleged in Paragraph 3 of the Final Office Action that "[r]egarding claims 1 and 9, Shapiro discloses: a packet header (see item 38 of figs. 1-2 and item 54 of fig. 2); and a payload (see item 40 of figs. 1-2 and item 54 of fig. 2) having at least one texture unit of AC coefficients from a single subband of a hierarchical subband decomposed image (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". Additionally, the Examiner alleged that "[r]egarding claim 7, Shapiro discloses: generating a packet header (see items 10 & 38 of fig. 1 and item 54 of fig. 2); and generating a payload (see items 10 & 40 of figs. 1 and item 54 of fig. 2) having at least one texture unit consisting only of AC coefficients from a single subband of a hierarchical subband decomposed image (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". Appellant respectfully disagrees.

Shapiro only teaches a method and apparatus for emphasizing a

selected portion of an image during a coding process. Specifically, Shapiro allocates more bits to a selected region of an image at the expense of other regions of the image. Shapiro discloses a novel image processing method, but is devoid of any disclosure in the packetization of the encoded image.

The Board's attention is directed to the fact that Shapiro fails to teach or suggest a payload having at least one texture unit consisting only of AC coefficients from a single subband of a hierarchical subband decomposed image. Specifically, Appellant's claims 1 and 7 positively recite:

> 1. A data structure stored on a computer readable medium comprising:
> a packet header; and
> a payload having at least one texture unit consisting only of AC coefficients from a single subband of a hierarchical subband decomposed image. (emphasis added)
>
> 7. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:
> (a) generating a packet header; and
> (b) generating a payload having at least one texture unit consisting only of AC coefficients from a single subband of the hierarchical subband decomposed image. (emphasis added)

Appellant's invention teaches a method and apparatus for packetizing a data structure that improves error resilience when applied to the coding of hierarchical subband decomposed coefficients. Namely, if an error occurs in a packet or a portion thereof, the overall amount of information that is lost is minimized. In one embodiment, Appellant's invention generates a data structure having a packet header and a payload having at least one text unit **consisting only of AC coefficients from a single subband of the hierarchical subband decomposed image**.

In contrast, the section cited by the Examiner (Shapiro, Figure 3 and column 4, lines 1-28) is directed to a standard wavelet hierarchical subband decomposition of an image. In this wavelet decomposition, an image is initially decomposed using times two subsampling into four frequency

subbands. The low vertical, low horizontal (LL) subband is then further subsampled to produce another set of four subbands. This is a standard image processing method. Namely, the cited section is **totally devoid** of any teaching or suggestion of how these subbands should be packetized. **Decomposing an image into subbands is not Appellant's invention and such invention does not fall within the scope of any of Appellant's claims.** Instead, Appellant's invention is directed toward the packetization or specific arrangement of data within the packet payload after the image has been processed.

In other words, Shapiro only teaches a particular method of image processing to produce an encoded image for packetization, but Shapiro is completely silent as to how packetization of the encoded image should be accomplished. In fact, the Examiner only pointed to Figures 1-2 that show item 40 as being data bits behind header bits. Thus, at best, the Examiner is reiterating the standard packetizing method where **no** distinction is made as to how different subband coefficients are to be packetized. This lack of packetization structure is the exact criticality that Appellant's invention is designed to address. Namely, a standard wavelet decomposition does **not**, by itself, teach or suggest packetizing at least one texture unit consisting only of AC coefficients from a single subband of the hierarchical image. Thus, without any teaching as to specific packetizing methods, Shapiro then further fails to teach a texture unit consisting only of AC coefficients from a single subband of the hierarchical subband decomposed image.

In fact, Shapiro states that "said stream having a header, forming a bit stream header, and appending the encoded image bit stream to the bit stream header". (See Shapiro, Column 2, lines 56-58). Shapiro also states that "[t]he decoder 1000, which operates in the converse of the encoder 28 of FIG. 5, includes means 1002 for decoding the incoming bit stream 1004 to separate the header bits from the data bits" and "[t]he data bits are provided as an input 1006 to the Dominant List decoder 1008". (See Shapiro, Column 11, lines 1-5). These cited quotations from Shapiro are clear indications that

Shapiro simply attaches a header and then provides a payload of data behind the header without any specific structures. There is absolutely no teaching or suggestion of Appellant's invention as to specific arrangement of data within the payload. For example, first Shapiro does not define a "texture unit" of data in the payload. Second, Shapiro does not limit the texture unit of consisting only of AC coefficients from a single subband of the hierarchical image. This is an important limitation that will assist in the error resilience of the present invention.

For example, if a packet is corrupted, then Appellant's decoder is able to determine exactly which subband will be affected by the corrupted packet. This knowledge will allow the decoder to implement error recovery methods, e.g., replacement of the corrupted coefficients from a different subband of a different resolution that correlates to the same spatial location. Thus, Appellant's novel payload structure provides information to the decoder as to how error recovery can be best implemented.

The Examiner, in Paragraph 4 of the Final Office Action, stated that Appellant's arguments in the response to the Office Action amounted to a "general allegation that the claims define a patentable invention without specifically pointing out how the language of the claims patentably distinguishes them from the references." Specifically, the Examiner stated "In response to applicant's arguments regarding claim 1 and 7, the recitation specific packetizing methods has not been given any patentable weight because the recitation occurs in the preamble. ... In addition, the term specific is not present any where in the claim." The Examiner further noted "in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., specific) are not recited in the rejected claim(s)." The Appellant respectfully disagrees with the Examiner's interpretation of Appellant's response to the Office Action.

The Examiner has completely misconstrued Appellant's response to the Office Action. In the response to the Office Action, the Appellant

mentioned "Thus, without any teaching as to specific packetizing methods, Shapiro [further] fails to teach a texture unit consisting only of AC coefficients from a single subband of the hierarchical subband decomposed image." The meaning of this statement is clear when read in context with the previous sentence. Since Shapiro does not describe how different subband coefficients are packetized in the payload, it follows that Shapiro cannot teach any packetizing method or packetized configuration of the payload. Thus, the word "specific" was used to indicate that Shapiro does not teach any particular packetized configuration of the payload as positively claimed by the Appellant. The word "specific" was **not** used to indicate a limitation in the claims. It is used to convey the inapplicability of the Shapiro reference against Appellant's invention.

The Examiner noted that "the examiner is entitled to give the broadest reasonable interpretation to the language of the claims." Using this principle, the Examiner considered "Shapiro's data bits [40] representative of the encoded image ... to be Appellant's payload having claimed features within the broad meaning of the term." The Appellant respectfully disagrees.

It appears that the Examiner is taking the over reaching position that Appellant's invention is anticipated, because Shapiro merely discloses a payload with data bits and that simple disclosure has the effect of anticipating the claimed features as claimed in Appellant's claims 1 and 7. The acceptance of such an over reaching argument would effectively render all possible structures of a payload (including those payload structures that have yet to be invented) as being anticipated. That is equivalent to a position that since the Examiner is able to find a circuit board, then all future novel circuits are anticipated or that since Examiner is able to find an encoder then all future encoders are anticipated regardless of any novel structures or functions. However, this argument is **not** the standard of 35 U.S.C. § 102. The correct standard under 35 U.S.C. § 102 is whether a single reference teaches every element of the claim. See

MPEP 2131. Applying the correct standard to the cited reference, Shapiro teaches a payload that contains data bits representative of an encoded image. That is all the disclosure within Shapiro on the topic of packetization. However, Shapiro is devoid of any teaching of a payload having at least one texture unit consisting only of AC coefficients from a single subband of the hierarchical image. As such, Shapiro fails to teach every element in claims 1 and 7 of Appellant's invention. It is respectfully requested that the Board find support in the Examiner's Reply Brief for the Examiner's position that such teaching exists in Shapiro.

Therefore, the Appellant respectfully submits that claims 1 and 7 fully satisfy the requirements of 35 U.S.C. § 102 and are patentable thereunder.

B. 35 U.S.C. § 102 - Claims 2 & 8.

The Examiner rejected claims 2 and 8 in Paragraph 3 of the Final Office Action as being unpatentable over Shapiro (U.S. patent 5,563,960, issued October 8, 1996). The rejection is respectfully traversed.

Specifically, the Examiner alleged in Paragraph 3 of the Final Office Action that "[r]egarding claim 2, Shapiro discloses: a packet header (see item 38 of figs. 1-2 and item 54 of fig. 2); and a payload (see item 40 of figs. 1-2 and item 54 of fig. 2) having at least one texture unit only of AC coefficients from all subbands of a decomposition level of a hierarchical subband decomposed image (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner also alleged that "[r]egarding claim 8, Shapiro discloses: generating a packet header (see items 10 & 38 of fig. 1 and item 54 of fig. 2); and generating a payload (see items 10 & 40 of figs. 1 and item 54 of fig. 2) having at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of the hierarchical subband decomposed image (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner is incorrect.

The Board's attention is again directed to the fact that Shapiro also

fails to teach or suggest a payload having at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of a hierarchical subband decomposed image. Specifically, the Appellant's claims 2 and 8 positively recite:

> 2. A data structure stored on a computer readable medium comprising:
> a packet header; and
> a payload having at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of a hierarchical subband decomposed image. (emphasis added)
>
> 8. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:
> (a) generating a packet header; and
> (b) generating a payload having at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of the hierarchical subband decomposed image. (emphasis added)

The Examiner again cited to Figure 3 and column 4, lines 1-28 of Shapiro as teaching a payload "having at least one texture unit only of AC coefficients from all subbands of a decomposition level of the hierarchical subband decomposed image." The Appellant respectfully disagrees.

As discussed above in Section A, the cited section is totally devoid of any teaching or suggestion of a payload having a texture unit consisting only of AC coefficients. Thus, the cited section cannot teach or suggest a texture unit consisting only of AC coefficients from **all** subbands of a decomposition level of the hierarchical subband decomposed image as in claims 2 and 8 of Appellant's invention.

As in the above novel payload structure of section A, claims 2 and 8 recite the novel structure where the payload has at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of the hierarchical subband decomposed image. There is absolutely no teaching or suggestion of Appellant's invention as to specific arrangement of data within the payload. For example, first Shapiro does not define a

"texture unit" of data in the payload. Second, Shapiro does not limit the texture unit of consisting only of AC coefficients from all subbands of a decomposition level of the hierarchical subband decomposed image. This is an important limitation that will assist in the error resilience of the present invention.

For example, if a packet is corrupted, then Appellant's decoder is able to determine exactly which decomposition level will be affected by the corrupted packet. This knowledge will allow the decoder to implement error recovery methods, e.g., replacement of the coefficients in the corrupted decomposition level from other decomposition levels, e.g., from lower or higher resolution levels. Thus, Appellant's novel payload structure provides information to the decoder as to how error recovery can be best implemented.

Therefore, the Appellant respectfully submits that claims 2 and 8 fully satisfy the requirements of 35 U.S.C. § 102 and are patentable thereunder.

C. 35 U.S.C. § 102 – Claims 3 & 9.

The Examiner rejected claims 3 and 9 in Paragraph 3 of the Final Office Action as being unpatentable over Shapiro (U.S. patent 5,563,960, issued October 8, 1996). The rejection is respectfully traversed.

Specifically, the Examiner alleged in Paragraph 3 of the Final Office Action that "[r]egarding claim 3, Shapiro discloses: a packet header (see item 38 of figs. 1-2 and item 54 of fig. 2); and a payload (see item 40 of figs. 1-2 and item 54 of fig. 2) having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller that a number of decomposition levels of a hierarchical subband decomposed image (see fig. 3-5; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner also alleged that "[r]egarding claim 9, Shapiro discloses: generating a packet header (see items 10 & 38 of fig. 1 and item 54 of fig. 2); and generating a payload (see items 10 & 40 of fig. 1 and item 54 of fig. 2) having

a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller that a number of decomposition levels of a hierarchical subband decomposed image (see fig. 3-5; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner is simply incorrect.

The Board's attention is again directed to the fact that Shapiro also fails to teach or suggest a payload having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of decomposition levels of a hierarchical subband decomposed image. Specifically, the Appellant's claims 3 and 9 positively recite:

> 3. A data structure stored on a computer readable medium comprising:
> a packet header; and
> a payload having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of decomposition levels of a hierarchical subband decomposed image. (emphasis added)
>
> 9. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:
> (a) generating a packet header; and
> (b) generating a payload having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image. (emphasis added)

The Examiner cited to Figures 3-5 and column 4, lines 1-28 of Shapiro as teaching a payload "having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image." The Appellant respectfully disagrees.

As discussed above in Sections A, and B, Figure 3 and column 4, lines 1-28 of Shapiro is totally devoid of any teaching or suggestion of a payload having a texture unit consisting only of AC coefficients. Figure 4 is directed to a parent-child relationship of an image decomposed to three

scales. Figure 5 teaches an encoder having a filter means for performing standard hierarchical decomposition. Thus, Figures 4 and 5 also fail to teach or suggest a packet having a texture unit consisting only of AC coefficients.

As in the above novel payload structure of sections A and B, claims 3 and 9 recite the novel structure where the payload has <u>a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image</u>. There is absolutely no teaching or suggestion of Appellant's invention as to specific arrangement of data within the payload. For example, first Shapiro does not define a "texture unit" of data in the payload. Second, Shapiro does not limit the texture unit of <u>consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image</u>. This is an important limitation that will assist in the error resilience of the present invention.

For example, if a packet is corrupted, then Appellant's decoder is able to determine exactly which subbands will be affected by the corrupted packet. This knowledge will allow the decoder to implement error recovery methods, e.g., replacement of the corrupted coefficients from a different subband of a different resolution that correlates to the same spatial location. More importantly, by limiting how many subbands from across the different decomposition levels are to be in the same packet, this limitation increases the probability that there will be some uncorrupted coefficients left from some other resolution levels for use in replacing the corrupted coefficients. This is one reason why <u>n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image</u>.

For example, if all the coefficients of the same spatial location across all decomposition levels are transported in the same packet, the loss or corruption of this single packet will cause a significant error in one specific

spatial location on the image. Without very sophisticated recovery methodologies or computations, the decoder will not be able to recover coefficients for that specific spatial location. This may result in a decoded image that contains very noticeable errors. Thus, Appellant's novel payload structure provides information to the decoder as to how error recovery should be best implemented and also increases the probability of success of the error recovery method.

Thus, the cited sections by the Examiner fail to teach or suggest a texture unit consisting only of AC coefficients from n subbands, where n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image as in claims 3 and 9 of Appellant's invention. Therefore, the Appellant respectfully submits that claims 3 and 9 fully satisfy the requirements of 35 U.S.C. § 102 and are patentable thereunder.

D. 35 U.S.C. § 102 - Claims 4-5 and 10-11.

The Examiner rejected claims 4-5 and 10-11 in Paragraph 3 of the Final Office Action as being unpatentable over Shapiro (U.S. patent 5,563,960, issued October 8, 1996). The rejection is respectfully traversed.

First, dependent claims 4-5 and 10-11 depend directly or indirectly from claims 3 and 9 and recite additional features therefor. Since Shapiro fails to teach or suggest claims 3 and 9 of Appellant's invention, Appellant respectfully submits that dependent claims 4-5 and 10-11 are also not anticipated by the teachings of Shapiro and, as such, fully satisfy the requirements of U.S.C. § 102 and are patentable thereunder.

Second, dependent claims 4-5 and 10-11 specifically define the variable "n" as being "two" or "three". These limitations recite a specific embodiments of Appellant's invention as to the specific number of subbands of coefficients that are to be packetized into a packet. As discussed above, these limitations increase the probability that there will be some uncorrupted coefficients left from some other resolution levels for use in

replacing the corrupted coefficients during error recovery.

As such, Appellant respectfully submits that claims 4-5 and 10-11 are not anticipated by the teachings of Shapiro and, as such, fully satisfy the requirements of U.S.C. § 102 and are patentable thereunder.

E. 35 U.S.C. § 102 - Claims 6 and 12.

The Examiner rejected claims 6 and 12 in Paragraph 3 of the Final Office Action as being unpatentable over Shapiro (U.S. patent 5,563,960, issued October 8, 1996). The rejection is respectfully traversed.

Specifically, the Examiner alleged in Paragraph 3 of the Final Office Action that "[r]egarding claim 6, Shapiro discloses: a packet header (see item 38 of figs. 1-2 and item 54 of fig. 2); and a payload (see item 40 of figs. 1-2 and item 54 of fig. 2) having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner also alleged that "[r]egarding claim 12, Shapiro discloses: a packet header (see item 38 of figs. 1-2 and item 54 of fig. 2); and a payload (see items 10 & 40 of fig. 1 and item 54 of fig. 2) having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner is simply incorrect.

The Board's attention is directed to the fact that Shapiro also fails to teach or suggest a payload <u>having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane</u>. Specifically, the Appellant's claims 6 and 12 positively recite:

> 6. A data structure stored on a computer readable medium comprising:
> a packet header; and
> a payload <u>having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane</u>. (emphasis added)
>
> 12. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method

comprising the steps of:

(a) generating a packet header; and

(b) generating a payload having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane. (emphasis added)

As discussed above in Sections A-D, the cited section in Shapiro is directed to a standard wavelet hierarchical subband decomposition of an image. However, the cited section is also completely devoid of any teaching or suggestion of a payload having texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane.

Specifically, Appellant disclosed in FIG. 6 of Appellant's specification a schematic illustration of a texture unit 620 comprising of DC coefficients that are encoded in accordance with bitplanes, e.g., four bitplanes for each color components (Y, U, V). The texture unit 620 is also shown disposed within a packet structure 600.

In this embodiment, each texture unit 620 is defined as comprising only those bits from the DC transform coefficients that form a single bitplane. For example, the DC component LL_3 for each image can be represented in three color components: luminance (Y) , C_r(U), and C_b (V). It should be noted that the color components C_r, and C_b are typically defined as being one-fourth the size of the corresponding luminance color component.

Referring to Appellant's FIG. 9, a bitplane b_n is defined as comprising those bits from the DC transform coefficients that are of common "significance". For example, FIG. 9 illustrates 16 DC coefficients for the Y color component and four corresponding DC coefficients for each of the U and V color components. The non-zero coefficient values are expressed in binary form as an example. Thus, the most significant bit (MSB) of each DC coefficient of the Y color component form one bitplane, which also is defined as a texture unit in this embodiment. In turn, the next bitplane b_{n+1} is formed from the next most significant bit (MSB) of each DC coefficient of the Y color component and so on. Therefore, FIG. 9

illustrates 12 possible bitplanes that correspond to 12 texture units 620a-l of FIG. 6. It should be noted that the number of bitplanes is dependent on the maximum magnitude of the DC coefficients. Since the DC band carries more important coefficients as compared to high frequency AC coefficients, the present embodiment of defining a texture unit for the DC coefficients based on each bitplane greatly increases error resiliency. Namely, the lost of one corrupted texture unit will only result in a partial loss of information for each DC coefficient. Thus, by using various error recovery or error concealment methods, error resiliency can be maximized for the important DC coefficients by defining each texture unit as comprising only those bits from the DC transform coefficients that form a single bitplane.

It is respectfully requested that the Board find support in the Examiner's Reply Brief for the Examiner's position that such teaching exists in Shapiro. Therefore, the Appellant respectfully submits that claims 6 and 12 fully satisfy the requirements of 35 U.S.C. § 102 and are patentable thereunder.

F. 35 U.S.C. § 102 – Claim 13.

The Examiner rejected claim 13 in Paragraph 3 of the Final Office Action as being unpatentable over Shapiro (U.S. patent 5,563,960, issued October 8, 1996). The rejection is respectfully traversed.

Specifically, the Examiner alleged in Paragraph 3 of the Final Office Action that "[r]egarding claim 13, Shapiro discloses: generating a packet header (see items 10 & 38 of fig. 1 and item 54 of fig. 2); and generating a payload (see items 10 & 40 of fig. 1 and item 54 of fig. 2) for carrying coefficients, where said payload has a payload size that varies in accordance with coefficients from a subband or decomposition level of said hierarchical subband decomposed image (see fig. 3; col. 3, lines 48-49; and col. 4, lines 1-28)". The Examiner is simply incorrect.

The Board's attention is directed to the fact that Shapiro also fails to teach or suggest a payload carrying coefficients, where said payload has a

payload size that varies in accordance with coefficients from a subband or decomposition level of said hierarchical subband decomposed image. Specifically, the Appellant's claim 13 positively recites:

> 13. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:
> (a) generating a packet header; and
> (b) generating a payload for carrying coefficients, where said payload has a payload size that varies in accordance with coefficients from a subband or decomposition level of said hierarchical subband decomposed image. (emphasis added)

As discussed above in Sections A-E, the cited section is directed to a standard wavelet hierarchical subband decomposition of an image. However, the cited section is completely devoid of any teaching or suggestion of a payload having a variable payload size, much less a payload size that varies with coefficients from a subband or decomposition level of a hierarchical subband decomposed image.

More specifically, Appellant disclosed that the importance of the coefficients in different subbands (or frequency range) is different. In general, in hierarchical subband coding, the coefficients in the lower frequency bands are more important than the ones in higher frequency bands. Thus, instead of using constant target length for all packets, in one embodiment of the present invention, the target packet size varies in accordance with subbands and decomposition levels. Specifically, a smaller packet size is employed for the more important coefficients and a larger packet size is employed for the less important coefficients. In the context of hierarchical subband coding, a smaller packet size is employed for the lower frequency subbands and a larger packet size is employed for the higher frequency subbands. This embodiment provides greater error protection because the effect from the loss of an "important" texture packet is minimized due to its reduced packet size, i.e., losing less information for each corrupted important packet.

More specifically, as an example, the present embodiment employs a

small packet size of N bits for the lowest frequency subband, e.g., LL_3. Next, the packet size is increased to "a" x N, where "a" is greater than or equal to 1 for the subbands of the next decomposition level, e.g., HL_3, HH_3, and LH_3 and so on.

It is respectfully requested that the Board find support in the Examiner's Reply Brief for the Examiner's position that such teaching exists in Shapiro. Therefore, the Appellant respectfully submits that claim 13 fully satisfies the requirements of 35 U.S.C. § 102 and is patentable thereunder.

CONCLUSION

For the reasons advanced above, Appellant respectfully urges that the rejections of claims 1-13 as being unpatentable under 35 U.S.C. § 102 are improper. Reversal of the rejections in this appeal is respectfully requested.

To the extent necessary, a petition for an extension of time under 37 C.F.R. 1.136 is hereby made. If necessary, please charge any shortage in fees due in connection with the filing of this paper, including extension of time fees, to Deposit Account 20-0782 and please credit any excess fees to such deposit account.

5/21/01

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I hereby certify that this paper or fee is being deposited on May 21, 2001 with the United States Postal Service as first class mail under 37 CFR 1.8 and is addressed to the Assistant Commissioner for Patents, Washington, D.C. 20231.

Linda DeNardi
Signature of person mailing paper or fee

LINDA DENARDI
Name of person mailing paper or fee

CLAIMS UNDER APPEAL IN SN 09/377,383

1. A data structure stored on a computer readable medium comprising:
a packet header; and
a payload having at least one texture unit consisting only of AC coefficients from a single subband of a hierarchical subband decomposed image.

2. A data structure stored on a computer readable medium comprising:
a packet header; and
a payload having at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of a hierarchical subband decomposed image.

3. A data structure stored on a computer readable medium comprising:
a packet header; and
a payload having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of decomposition levels of a hierarchical subband decomposed image.

4. The data structure of claim 3, where n is two.

5. The data structure of claim 3, where n is three.

6. A data structure stored on a computer readable medium comprising:
a packet header; and
a payload having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane.

7. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:
(a) generating a packet header; and

(b) generating a payload having at least one texture unit consisting only of AC coefficients from a single subband of the hierarchical subband decomposed image.

8. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:

(a) generating a packet header; and

(b) generating a payload having at least one texture unit consisting only of AC coefficients from all subbands of a decomposition level of the hierarchical subband decomposed image.

9. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:

(a) generating a packet header; and

(b) generating a payload having a texture unit consisting only of AC coefficients across n subbands, where n represents a number smaller than a number of the decomposition levels of the hierarchical subband decomposed image.

10. The method of claim 9, where n is two.

11. The method of claim 9, where n is three.

12. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:

(a) generating a packet header; and

(b) generating a payload having a texture unit comprising bits from a plurality of DC transform coefficients that form a single bitplane.

13. A method for packetizing a hierarchical subband decomposed image having a plurality of decomposition levels, said method comprising the steps of:

(a) generating a packet header; and

(b) generating a payload for carrying coefficients, where said payload has a payload size that varies in accordance with coefficients from a subband or decomposition level of said hierarchical subband decomposed image.